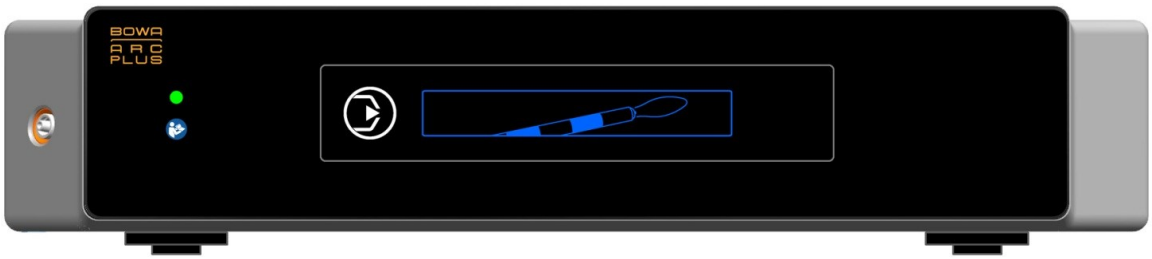
OPERATING MANUAL
ARGON COAGULATION UNIT



BOWA
ARC
PLUS

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Scope of delivery

- ARC PLUS
- Fibre optic cables (2x 90 mm)

- Extension power cable, Y-type

- Connector covers
- Operating manual

1. Using this Operating Manual

This operating manual is part of the product.

BOWA-electronic GmbH & Co. KG, referred to in the following simply as BOWA, assume no liability nor provide any warranty whatsoever for any damage or consequential damages arising from non-compliance with the operating manual.

- ▶ Read the operating manual carefully and thoroughly before using this device.
- ▶ Store the operating manual in a safe place throughout the service life of the device.
- ▶ Keep the operating manual accessible to operating theatre personnel.
- ▶ Give the operating manual to each successive owner and/or user of this device.
- ▶ Always update the operating manual whenever you receive additional information from the manufacturer.

1.1. Revision index

Software version	Last revised
Valid from Version 1.0	2012/12

1.2. Scope of validity

This operating manual applies only to the devices designated on the title page.

1.3. Other applicable documents

- ▶ Comply with other applicable documents mentioned in the appendix or in the other sections.

1.4. Symbols and notation

1.4.1. Format of warning instructions

⚠ ATTENTION

Nature, source and consequences of the hazard (risk of personal injury)

▶ Measures for avoiding the risk

NOTE

Nature, source and consequences of the hazard (risk of property damage)

▶ Measures for avoiding the risk

1.4.2. Hazard levels of warning instructions

Symbol	Hazard level	Probability of occurrence	Consequences of non-compliance
	DANGER	Immediate risk	Death or serious injuries
	WARNING	Possible risk	Death or serious injuries
	CAUTION	Possible risk	Minor injuries
	NOTE	Possible risk	Property damage

1.4.3. Tips

Tips and additional information for easier working

1.4.4. Other symbols and notation

Symbol or notation	Meaning
☑	Prerequisite for an activity
▶	Activity with one step
1. 2. 3.	Activity with several steps in strict sequence
↳	Result of preceding activity
•	List (first level)
•	List (second level)
Emphasis	Emphasis
....., see Section “xxx”, page xxx	Cross reference
... Purge button **3**	Numbers in bold face (e.g. **3**) refer to marked items on photos of the device

2. Safety

2.1. Intended use

Argon plasma coagulation is particularly suitable for the thermal coagulation of tissue surfaces for haemostasis of surface bleeding on parenchymatous organs and for devitalising tissues, among other uses.
The key advantages of this method are:
Application does not involve contact, so there is no adhesion of tissue or other material to the electrodes leading to degradation of effectiveness (in contrast to conventional electrosurgery).

The maximum penetration depth of the coagulation effect is 3 mm, and it is evenly distributed over the coagulated surface. This reduces the risk of penetration of thin-walled structures.
Smoke generation is significantly reduced, which particularly in endoscopic applications improves visibility and leads to shorter surgery times.
Carbonisation of tissue is avoided, which facilities better wound healing.

With the aid of suitable electrodes, argon-assisted cutting is also possible. The main advantage of this is reduced smoke formation.

The ARC PLUS argon device is used in combination with the ARC 350 (900-351) or ARC 400 (900-400) HF generator for cutting and coagulation in open and endoscopic surgery.

The following are suitable application areas:

- General surgery
- Gynaecology
- Casualty surgery
- Plastic and reconstructive surgery
- Gastroenterology
- Laparoscopy
- Thorascopy
- Bronchoscopy

The argon coagulation unit should not be used if, in the opinion of an experienced physician or according to current professional literature, such use would endanger the patient, due for example to the general condition of the patient, or if other contra-indications are present. Trimming stents with argon coagulation is contra-indicated.

BOWA presumes that the argon and HF devices are operated under the supervision of qualified or authorised personnel. The surgeon and the medical staff must be trained in the fundamental principles, rules for use and risks of HF surgery and must be familiar with these in order to safely and reliably avoid putting patients, staff and equipment at risk. Contact your BOWA dealer if there is a need for training or training documents.

Any other use is neither intended nor proper and must be effectively prevented.

2.2. General safety instructions

- Observe the instructions on electromagnetic compatibility (see Section “EMC”, page 43).
- Always connect the HF device to a mains power system with a protective earth lead in order to prevent electric shock.

NOTE

The ARC PLUS device may only be operated with the ARC 350 (REF 900-351) and ARC 400 (REF 900-400) HF generators with software version 1.0.0.4.16.8 or later.

Additional devices connected to electrical medical devices must satisfy relevant IEC or ISO standards (e.g. IEC 60950 for data processing devices). Furthermore, all configurations must comply with the standard requirements for medical systems (see IEC 60601-1-1 or Section 16 of the third edition of IEC 60601-1, as relevant). Anyone who connects additional devices to medical electrical devices is perforce a system configurator and therefore responsible for meeting standardised system requirements. Please note that local laws prevail over the aforementioned standard requirements. In case of questions, please contact your local dealer or service centre (see Section “Technical service”, page 39).

NOTE

Impairment of other devices.

Electromagnetic interference fields are generated during normal use of the argon device.

- Ensure that no electronic devices that may be impaired by electromagnetic fields are placed in the vicinity of the argon and HF devices.

The following measures are advisable:

- Place sensitive devices in a separate location.
- Use separate mains power circuits.
- Keep HF cables as short as reasonably possible.
- Do not route HF cables and camera cables next to each other.

Argon gas

- Ensure that only argon gas with purity grade 4.8 or better is used.
- All connected instruments must be purged with argon gas before use.
- Close the gas bottle(s) after every use. Refill gas bottle in accordance with applicable national standards.

2.3. Personal safety instructions

2.3.1. Ambient conditions

- Do not operate the HF device in the immediate vicinity of the patient. Observe the minimum distances recommended by BOWA, as shown in the following figure.

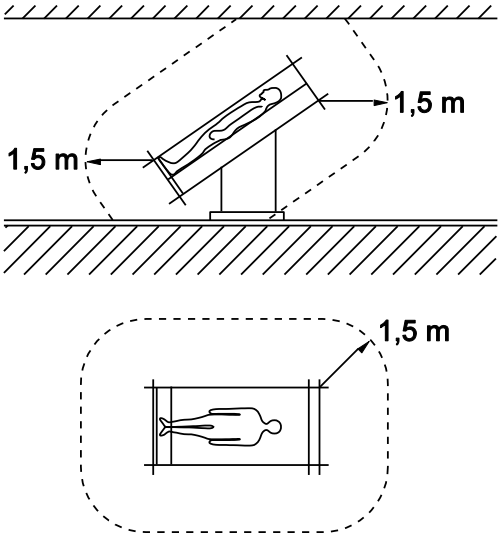


Figure 2-1: Patient environment

2.3.2. Patients with pacemakers

Malfunction or destruction of the pacemaker can endanger the life of the patient or result in irreversible injuries to the patient.

- In the case of patients with pacemakers, consult the cardiologist before carrying out HF surgery.
  This applies in particular to surgery in the thorax region.
- Observe the corresponding instructions in the operating manual for the HF device.
- Attach the HF neutral electrode close to the operating field.
- Set the demand pacemaker to a fixed frequency.
- Ensure that the pacemaker does not come into contact with the HF electrode.
- Keep a fully operational defibrillator within reach.
- Carry out a postoperative pacemaker check.

2.3.3. Patient preparation

- To avoid emphysemas, do not insert the electrodes into tissue or open vessels, or apply them directly to tissue or open vessels.
- Always keep the distal end of the electrode visible during surgery.
- Due to the monopolar operating mode, the HF current flows through the patient’s body to the neutral electrode. For this reason, always ensure that no thermal damage occurs to nearby tissue structures with a tendency to increased local current density.
- In the case of gastrointestinal surgery, the endogenous gases must be securely removed by purging before and during surgery.
- Position the patient so that the patient is not touching any metal parts that are grounded or have considerable capacitance relative to ground (e.g. operating table brackets). If necessary, place anti-static towels between the patient and the bedding.
- Ensure that the patient does not touch any wet towels or bedding.
- Avoid skin-to-skin contact.
- Place anti-static towels between areas of heavy sweating and skin-to-skin contact on the patient's trunk.
- Ensure a suitable support surface in order to prevent pressure necrosis.
- Drain urine via a catheter.

2.4. Device-related safety instructions

Devices manufactured by BOWA are developed in accordance with the current state of technology and generally accepted safety rules. Despite this, risks to the life and health of the user or other parties and/or damage to the device and other objects can occur.

- Use only accessories approved by BOWA; see Section “
-
-
- Accessories and Spare Parts”, page 42.
- Use the device only if it is free from technical defects and in good working order and only for the intended purpose, always remaining aware of safety requirements and risks while complying with this operating manual.
- Have malfunctions that can adversely affect safety (e.g. deviations from the permissible operating conditions) repaired without delay.
- Wipe down the HF device only with cleaning agents and disinfectants that are nationally approved for surface cleaning. See Section “Disinfection and cleaning”, page 36.
- Never immerse the device in water or cleaning agents.
- Never use automatic equipment to disinfect the device.
- Immediately drain any fluid that may have penetrated the device.

If the argon device has previously been stored or transported at temperatures below +10 °C, it will take approximately three hours to adjust to room temperature.

2.4.1. Correct connection of the argon device

The HF voltages present during electrosurgery can cause interference to imaging devices. This interference can be largely eliminated by suitable grounding and screening.

- Always ground the argon and HF devices via the equipotential bonding terminals (e.g. to the equipotential rail of the equipment trolley). Connect the equipotential rail of the equipment trolley to the equipotential rail of the operating theatre, This will minimise interference to other electronic devices from the argon and HF devices.
- Do not place any equipment other than the ARC 350 or ARC 400 HF generator on top of the argon device.
- HF voltages are present during argon-assisted electrosurgery. Orderly insulation of all probes, electrodes, wiring and cables with respect to the HF generation being used must therefore be verified before each use.

Connection to the AC mains

- Connect the device directly to the AC mains.
- Caution: To avoid the risk of electric shock, always connect the device to a supply network with a protective earth lead.
- If the ARC PLUS forms part of a medical electrical system, the requirements in Section 16 of IEC 60601-1:2005 must be observed.
- If a medical electrical system is formed with the ARC PLUS by use of a multiple socket-outlet as a separate unit, a warning must be present to indicate that this multiple socket-outlet may not be placed on the floor.
- Avoid using multiple socket-outlets.
- Do not use any additional multiple socket-outlets or extension cables.
- Always ensure that the installation conforms to the allowable limits for leakage current and protective earth lead resistance. These limits may be exceeded if several devices (medical and non-medical) are connected to a multiple socket-outlet. The totality of devices connected to a multiple socket-outlet form a system and must be regarded as a unit.
- If a multiple socket-outlet is powered from an isolation transformer, ensure that no part of the system is at the same time powered from the regular supply mains, as otherwise galvanic isolation will no longer be present.
- If a multiple socket-outlet not powered from an isolation transformer is used, connections to devices used for medical purposes must only be possible with the aid of a tool.

2.4.2. Correct use of the argon device

Endoscopic use

In laparoscopic surgery the argon entering the body cavity increases the abdominal insufflation pressure (CO_2), unless a suitable arrangement to compensate for the pressure rise is provided.

- We recommend using an insufflator with pressure monitoring.
- To prevent potential damage to the camera optics, do not aim the argon plasma jet at the camera chip.

2.4.3. Correct connection and use of the argon gas bottle

- Observe the safety instructions of the gas supplier. Only personnel trained to deal with pressurised gas containers may handle these containers.
- Always transport gas bottles with the valve protector fitted, and avoid exerting force on the bottle and the pressure reducer.
- Observe the use instructions for the pressure reducer that is used.
- The maximum permissible inlet pressure at the device for operation from bottled gas is 4.5 bar.
- Use only argon with purity grade 4.8 or better.
- Protect the bottle against heating from external sources, such as open flames or radiators.
- Use only pressure reducers approved by BOWA.

Ref.	Designation	Electrical pressure sensor
900-901	Pressure reducer for ARC PLUS, DIN no. 6	-
900-902	Pressure reducer for ARC PLUS, DIN no. 10	-
900-903	Pressure reducer for ARC PLUS, CGA 580	-
900-904	Pressure reducer for ARC PLUS, BS 341 no. 3	-
900-906	Pressure reducer for ARC PLUS and ARC 400/350, DIN 477 no. 6	√
900-907	Pressure reducer for ARC PLUS and ARC 400/350, DIN 477 no. 10	√
900-908	Pressure reducer for ARC PLUS, CGA 400/350, CGA 580	√
900-909	Pressure reducer for ARC PLUS and ARC 400/350, BS 341 no. 3	√

- Do not use damaged gas bottles.
- Uncontrolled outflow of argon gas, if it reaches sufficient concentration in the atmosphere, can lead to oxygen deficiency and the associated consequences for the organism. For this reason, always check connections for leaks if you hear a persistent hissing sound.
- Do not use leaky gas bottles, pressure reducers or pressurised gas lines.
- Do not apply any lubricants to the pressure reducer, and do not use any tools for assembly.
- Up to two gas bottles can be connected using pressure reducers. For this purpose, use identical types of pressure reducers – i.e. two pressure reducers either both with or both without electronic pressure sensors.
  Connecting a pressure reducer with an electronic pressure sensor and a second pressure reducer without an electronic pressure sensor to the same device is not possible.

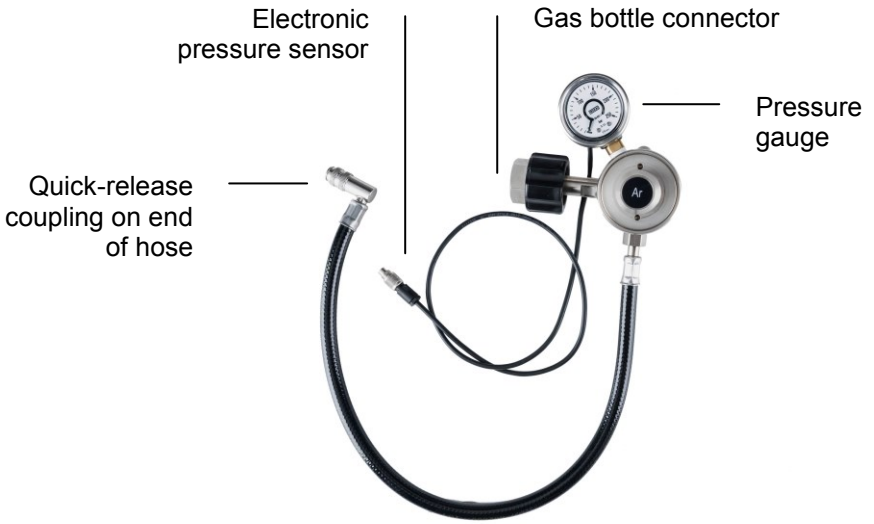


Figure 2-2: Pressure reducer with electronic pressure sensor

2.5. Safe handling (general instructions)

- Before each use of the device, check to ensure that it is functioning properly and is in good working order.
- Observe the instructions for use with regard to standards; see Section “Hazard levels of warning instructions”, page 8.
- Always observe and obey the acoustic signals or fault indications during use; see Section “Fault list”, page 34.
- The device and accessories may be operated and used only by persons who have the necessary training, knowledge and experience.
- Regularly inspect accessories, particularly electrode cables and endoscopic accessories, for damage to the insulation.
- Do not place any instruments on the patient or on the devices.
  - Avoid unintentional activation.
  - Avoid direct contact with the patient.
  - Avoid indirect contact through electrically conductive objects or wet cloths.
  - Temporarily place HF instruments not currently being used use in a beaker or in a dry area of the preparation trolley.
  - Always adjust the acoustic activation signal for good audibility.
- Ensure that no instruments are being cleaned when AUTOSTART is activated.
- Do not use needle electrodes as ECG electrodes.
- Wear suitable gloves during surgery.
- Always set the output power of the HF device as low as possible.
- The ARC PLUS coagulation unit may alternatively be connected to a central argon supply system. Along with the device configuration, the argon gas purity grade specified by BOWA and the specifications for the maximum inlet pressure must be met.
- The maximum permissible inlet pressure at the device for operation from a central gas supply network is 6.0 bar. The corresponding option must be selected on the argon device.

2.5.1. Surgical environment: prevention of explosions and ignition

Argon itself is not flammable, but the high temperature of the plasma can ignite other flammable materials and gases.

- For this reason, always purge endangered intestinal sections with argon or CO_2 gas before activating the HF current.
- Do not use the argon device in areas where there is a risk of explosion.
- Do not use any flammable or explosive liquids.
- Stop using the argon device if any display components fail.
- Avoid using ignitable anaesthetics and gases which support combustion (e.g. nitrous oxide or oxygen) during surgery in regions such as the head or thorax.
- Use only non-flammable cleaning agents, disinfectants and solvents (for adhesives). If you use flammable cleaning agents, disinfectants or solvents, ensure that they have fully evaporated before using the HF surgical equipment.
- Ensure that no flammable liquids collect beneath the patient or in body cavities (e.g. the vagina). Suction and/or purge body cavities before activating the device.
- Wipe off all liquids before using the HF device.
- Ensure that no endogenous gases are present that could ignite.
- Ensure that all materials saturated with oxygen (e.g. cotton or gauze) are kept far enough away from the HF environment that they cannot ignite.
- Always check oxygen lines for leaks.

If the output power is not sufficient with the customary settings, first ensure that:

- the neutral electrode is correctly attached;
- the working electrodes are clean;
- the connectors are properly connected;

before selecting a higher output power.

- Do not use the device if even the smallest irregularity is present.

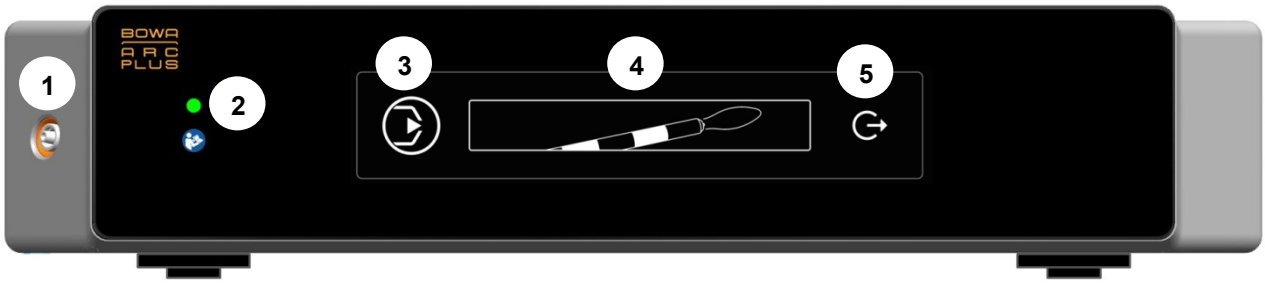
2.5.2. Application of the neutral electrode

Observe the instructions for use of the neutral electrode in the operating instructions of the HF device and the instructions on the packaging of the neutral electrode.

3. Description

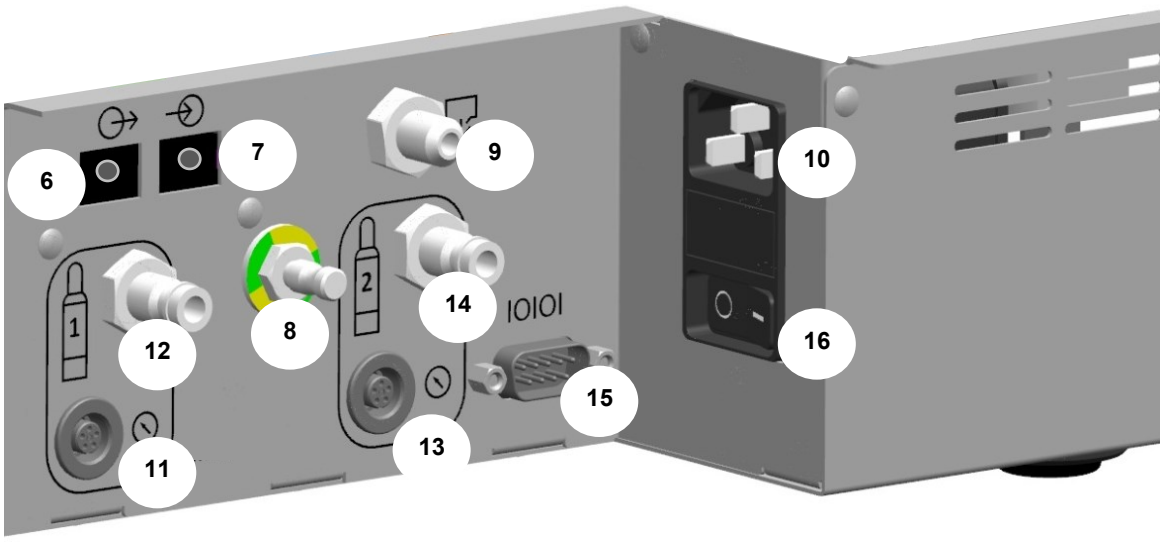
3.1. Controls and indicators

3.1.1. Front panel controls and indicators



1	Luer Lock gas connector; for argon instruments only		
2	Operating state indicator	Off:	Device switched off or no power connection
		Orange:	Sleep mode
		Green:	Standby mode
3	Purge button	White:	Standby mode
		Green:	Purging
4	Gas status indicator	White:	Self-test
		Green:	Purging
		Yellow:	Cutting
		Blue:	Coagulating
		Red:	Fault condition
5	Fault indicator	Red:	Fault

3.1.2. Rear panel controls and connectors



6	Fibre optic signal output connector
7	Fibre optic signal input connector
8	Equipotential bonding terminal
9	Bleed stub for pressure reducer connection hose
10	IEC chassis-mount power connector
11	Connector for electronic pressure sensor (gas bottle 1)
12	Connector for pressure reducer (gas bottle 1)
13	Connector for electronic pressure sensor (gas bottle 2)
14	Connector for pressure reducer (gas bottle 2)
15	UART Serial communication port
16	Power switch

3.2. Symbols on the device

Symbol	Designation
	Purge button
	Fault indicator
	Gas status indicator
	Connector for gas bottle 1
	Connector for gas bottle 2
	Connector for electronic pressure sensor
	Bleed stub for pressure reducer
	Fibre optic signal output
	Fibre optic signal input
	Equipotential bonding
	Fuse
	Alternating current
	HF energy in the range of 9 kHz to 400 GHz is used when the HF device is activated. This energy generates electromagnetic radiation.
	Labelling of electrical and electronic devices in accordance with Directive 2002/96/EC (WEEE); see "Disposal"
	Manufacturer
	Date of manufacture
	Observe operating instructions
IOIOI	UART Serial communication port

3.2.1. Rating label

NETZSPANNUNG / LINE VOLTAGE 100-240 V~
NETZFREQUENZ / LINE FREQUENCY 50/60 Hz
NETZSTROM / INPUT CURRENT 0,6 A
SICHERUNG / LINE FUSE T 1,0 A
SCHUTZKLASSE / SAFTEY CLASS I
SCHUTZART / TYPE OF PROTECTION IP22
EINGANGSDRUCK / INPUT PRESSURE max. 4,5bar / 65psi
REF 900001
SN 90100001
V1.00
0123
2012-11
MADE IN GERMANY
BOWA-electronic GmbH & Co. KG Heinrich-Hertz-Strasse 4-10 D- 72810 Gomaringen

Figure 3-1: ARC PLUS rating label

3.3. Components required for operation

- Power cable
- Filled argon gas bottle with pressure reducer
- Argon interconnect cable for rigid or flexible argon electrodes
- Rigid or flexible argon electrodes
- Two fibre optic cables
- HF generator, including Argon option
- Neutral electrode (connected to HF device)

3.4. Operating conditions

Temperature	+10 to +40°C
Relative humidity	30 to 75%, non-condensing
Atmospheric pressure:	700 to 1600 hPa
Max. operating elevation:	≤ 4000 m

4. Preparation

4.1. Setting up the argon device

NOTE

Electromagnetic fields are generated during normal use of the argon and HF devices. This can adversely affect other devices.

▶ Ensure that no electronic devices are placed in the vicinity of the argon and HF devices.

Argon and HF devices may only be used in rooms used for medical purposes that fulfil the requirements of DIN VDE 0100-710.

If the argon device has previously been stored or transported at temperatures below +10 °C, it will take approximately three hours to adjust to room temperature.

Before using the device for the first time, ensure that the combination of the argon device and the electrosurgery device has been functionally tested and the person(s) responsible for the operation of the devices has/have been instructed by the manufacturer or the supplier.

▶ The HF device, ARC PLUS device and argon bottle are usually fitted on an ARC CART equipment trolley with a gas bottle holder.

Figure 4-1: ARC CART

- Secure the argon gas bottle with the plastic strap provided for this purpose.
- Always place the ARC PLUS device below the HF device.
- The equipment trolley must be positioned outside the operating theatre zone with a potential risk of explosion.
  Ensure free circulation around the devices. Maintain a room temperature between +10 °C and + 40 °C and a relative humidity between 0 and 75%.
- To achieve the full dispensing accuracy of the ARC PLUS device, the device should be switched on approximately 10 minutes before the start of surgery.
- The ARC PLUS coagulation unit may alternatively be connected to a central argon supply system. Along with the device configuration, the argon gas purity grade specified by BOWA and the specifications for the maximum inlet pressure must be met. The responsibility for meeting these specifications rests with the hospital maintenance department.
- Connect the HF device and the ARC PLUS device to the equipotential rail with separate cables.
- Use the provided Y extension power cable or a mains power cable of equal quality with the appropriate national mark of approval.
- Connect the power cable of the HF device to the supplied Y extension power cable and connect it to the HF device and the ARC PLUS, and connect to the power cable to the AC mains.

NOTE

Verify that the actual AC mains voltage matches the rated voltage range specified for the device.

- Connect the two fibre optic cables to the corresponding connectors **6** and **7** of the ARC PLUS and the HF device.

Signal connector on ARC PLUS	Signal connector on ARC 350/400

A foot switch is necessary for using the operating modes for flexible argon application with the ARC generator. This switch must be connected to the rear panel of the ARC generator.

- Up to two gas bottles can be connected using pressure reducers (e.g. 900-901).
- Connect the quick-disconnect coupling on the end of the hose from the pressure reducer to either connector **12** or connector **14** on the ARC PLUS.
- Always use connector **11** for the electronic pressure sensor of the pressure reducer connected to connector **12**. Output **14** corresponds to connector **13**.

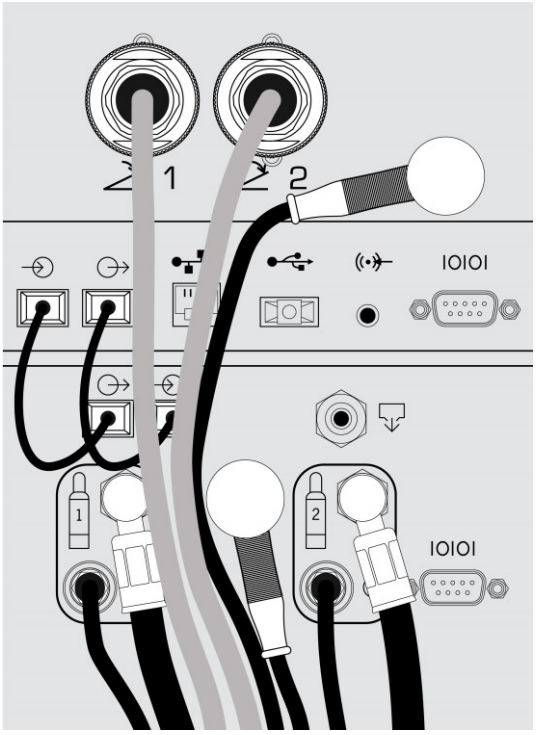


Figure 4-2: Example connections with an ARC 400, two gas bottles and pressure reducers with electronic pressure sensors

4.2. Switching on the argon device

Do not use the argon device if the display components are not working. For fault correction, see Section “Detecting and Correcting Faults“, page 34.

1. Connect the sterile filter, the argon interconnect cable and the instruments.
2. Switch on power switch **16** on the rear panel of the ARC PLUS.
3. Switch on the ARC 350 or ARC 400 and select an argon operating mode.

Figure 4-3: Sleep mode

4. The ARC PLUS is activated automatically, and the operating state indicator **2** changes from orange (Sleep) to green (Standby).

↳ The argon device carries out a self-test: all illuminated indicators and the internal pneumatic valves are tested.

5. Check that all indicators and LEDs on the front panel light up white.

Figure 4-4: Before purging

6. Acknowledge the display by touching the Purge button.
   – or –
   All illuminated indicators except the Purge button go dark after 10 seconds.
   Purge the system with argon gas by touching the Purge button.

↳ The argon device is ready for use.

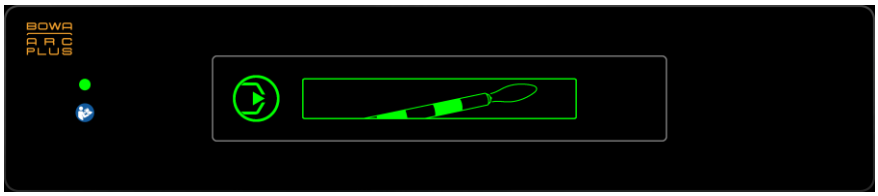


Figure 4-5: Purging active and Purge button actuated

7. Before starting surgery, check the fill level of the gas bottle on the pressure gauge of the pressure reducer, or on the status indicator on the HF generator as described in the operating instructions for the HF generator (e.g. "Argon menu" section for the ARC 400).
   The electronic pressure sensor reports the fill level, which is shown on the display of the associated HF generator (e.g. ARC 400). If the fill level of the bottle is adequate, the surgery can begin.
8. A new gas bottle must be connected when a message appears on the display of the HF device indicating that the argon pressure is less than 30 bar. If a second gas bottle is connected, changeover to the second gas bottle takes place automatically. The purpose of this monitoring function is to ensure that an adequate gas supply is available.

The argon device is de-activated automatically when an argon mode is not selected on the HF generator. The operating mode indicator **2** changes from green (Standby) to orange (Sleep).

NOTE

Observe the manufacturer's warnings and instructions for the accessories before connecting them to the device.

4.3. Connecting instruments

▶ Before connecting instruments, ensure that the following conditions are met:

- Accessory combinations not mentioned in the operating manual may be used only if they are explicitly specified for the intended use. Performance features as well as safety requirements must always be taken into account.
- The insulation of the accessories (e.g. HF cables and instruments) must be sufficient for the maximum output peak voltage (see IEC 60601-2-2 and IEC 60601-2-18).
- Accessories with defective insulation may not be used.

4.3.1. Use with flexible argon probes

Connect the connection cable with the flexible probe to the monopolar output of the HF device. After the system has been purged with argon gas by touching the Purge button, coagulation can be activated with the blue foot switch.

The ARC generator shows the gas flow rate and the fill levels of the argon gas bottles on the display when the HF generator is properly connected to the ARC PLUS.

Recommended settings:

- 25 W Argon Flexible mode on HF device
- 0.4 l/min Coag Flow on ARC PLUS

Perform a functional test before inserting the flexible probe into the working channel of the endoscope. To do this, immerse the tip of the probe in water and press the Purge button. If the equipment is working properly, the emerging gas will form bubbles. Also check the instruments for visible external defects.

For information regarding use with flexible argon probes and for recommended settings, see the operating instructions for the instruments.

4.3.2. Use with rigid argon probes

Connect a handpiece with suitable electrodes to the monopolar output. After the system has been purged with argon gas by touching the Purge button, the argon-assisted cutting or coagulation current can be activated by pressing the yellow or blue finger switch on the handpiece. The ARC generator shows the gas flow rate and the fill levels of the argon gas bottles on the display when the HF generator is properly connected to the ARC PLUS.

Recommended settings:

- 80 W coagulation power, Argon Open mode,
  or 100 W cutting power; Argon Open mode, on HF device
- 3.5 l/min Coag Flow or 4.0 l/min Cut Flow on ARC PLUS

Perform a functional test before using the rigid argon electrodes. To do this, immerse the tip of the probe in water and press the Purge button. If the equipment is working properly, the emerging gas will form bubbles. Also check the instruments for visible external defects.

For information regarding use with rigid argon probes and for recommended settings, see the operating instructions for the instruments.

4.3.3. Using a sterile filter

If there is height difference between the argon device and the tip of the electrode, body fluid may reach the argon device. For this reason, a sterile filter (830-050) must be fitted between the argon interconnect cable and the gas outlet connector **1** in order to avoid infections and prevent damage to the argon device. The filter is supplied in sterile condition and is disposable. It may not be reused.

- ▶ Screw the sterile filter into the gas outlet connector **1**.
- ▶ Screw the gas connector of the argon interconnect cable into the corresponding threaded coupling of the sterile filter.

Figure 4-6: Fitting the sterile filter and argon interconnect cable on the ARC PLUS

4.4. Functional test

4.4.1. Self-test

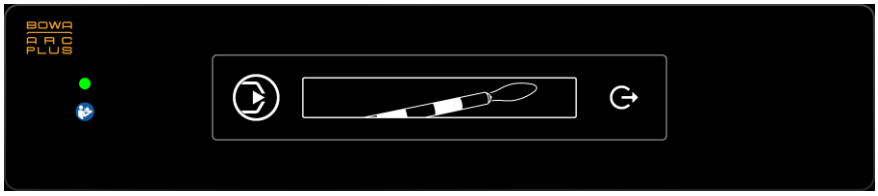


Figure 4-7: Self-test

When the argon device is switched on, it runs a self-test that checks the controls and indicators, acoustic signal, microprocessor and hardware for proper operation.

The argon device performs a new self-test when it is again activated after being switched off for at least 15 seconds or after being in standby mode for at least 8 hours.

4.4.2. Cyclical test during operation

During operation, safety-relevant functions and signals are tested cyclically. If serious faults are detected, the argon device switches off and the fault indicator on the display lights up red. For further information, see Section “Detecting and Correcting Faults“, page 34.

5. Operation

5.1. Activation and alarm signals

When the purging process is active, the ARC PLUS emits a continuous acoustic signal at a fixed volume.

Activation and alarm signals are generated by the HF generator.
The volume of the activation signal should be increased as necessary for use in relatively noisy surroundings. This can be done using the menu of the HF generator.

5.2. Emergency stop

The argon device can be switched off at any time by using on/off switch **16** as an emergency stop switch.

5.3. Settings and recommended parameter values

The recommended settings for HF power and argon gas flow stated in the previous section are based on experience. Specific working methods or other probes may make adjustments to these settings necessary, at the discretion of the surgeon. A general rule is that coagulation, especially endoscopic, must always be performed in plain view in order to avoid direct tissue contact.

Observe the instructions for use of the accessories concerned when selecting setting values. Selecting unsuitable parameter values may lead to damage to the accessories and/or injury to the patient.

Recommended settings for various argon applicators

Using the ARC HF generator in argon modes

With argon plasma coagulation, the combination of the spray voltage from the HF generator in the instrument or probe and the argon flow from the ARC PLUS forms a plasma jet. This plasma jet has a broad contact area on the tissue. The coagulation effect is self-limiting both in depth and on the surface. Argon plasma coagulation is primarily used in endoscopy (rigid or flexible). Argon plasma coagulation is also used in open surgery.

Cutting

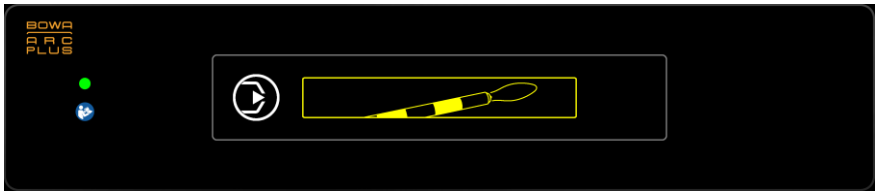


Figure 5-1: Cutting active

“Monopolar Cut – Argon” mode

This setting is intended to be used for argon-assisted cutting in open surgery with rigid argon probes. The coagulation effect is secondary here. This operating mode results in less smoke formation than cutting without argon assistance. The gas status **4** lights up yellow when Cut mode is active.

Coagulating

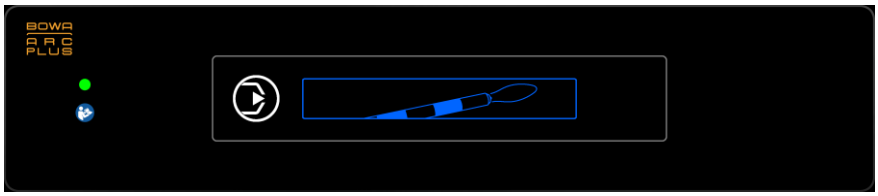


Figure 5-2: Coagulation active

“Monopolar Coag – Argon Open” mode

This setting is intended to be used for argon-assisted electrocoagulation in open surgery with rigid argon probes. When a coagulation mode is active, the gas status indicator **4** lights up blue.

“Monopolar Coag – Argon Flexible” mode

This setting is a general-purpose standard mode for endoscopic surgery with flexible argon probes.
This mode enables precise treatment of the tissue according to the selected energy level.
Deep coagulation and effective tissue devitalisation can be achieved with a relatively high energy level.
Homogeneous. precisely controlled tissue coagulation is possible when a relatively low energy level is selected,
The gas status indicator **4** lights up blue when this mode is active.

“Monopolar Coag – Argon Pulsed” mode

The Argon Pulsed mode is based on pulsed activation (on/off) and can be adjusted for both coagulation and devitalisation of tissue.
The pulse rate (1, 5 or 10 Hz) depends on the selected Effect level. This controlled application allows homogeneous tissue effects to be achieved.
The gas status indicator **4** lights up blue when this mode is active.

The following table summarises the recommended parameter settings for the HF device. Always set the power and the gas flow rate to the lowest values necessary for the surgery.

Mode	Effect range	Effect default	Power range	Max. power default	Flow rate limits	Flow rate default
Monopolar Cut – Argon	1 – 9	5	1 – 300 W	100	2.0 – 10.0 l/min	4.0 l/min
Monopolar Coag Argon Open	---	---	1 – 120 W	80	1.0 – 8.0 l/min	3.0 l/min
Monopolar Coag – Argon Flexible	---	---	1 – 120 W	25	0.1 – 1.6 l/min	0.4 l/min
Monopolar Coag – Argon Pulsed	1 – 3	2	1 – 80 W	25	0.1 – 1.6 l/min	0.4 l/min

Note

The diameter of the argon probe should be selected according to the diameter of the working channel of the endoscope that is used.
The length of the argon probe that is used depends on the length of the endoscope and the location of the surgery in the patient’s body.

Generators with Plug’n Cut COMFORT recognise BOWA COMFORT instruments and automatically select the appropriate parameter values.

The ignition distances may vary when CO_2 is used as an insufflation gas.
▶ Purge again with argon gas before use.

5.4. Selection and changeover of gas bottles

The fill levels of the gas bottles are shown on the display of the ARC 350 or ARC 400.

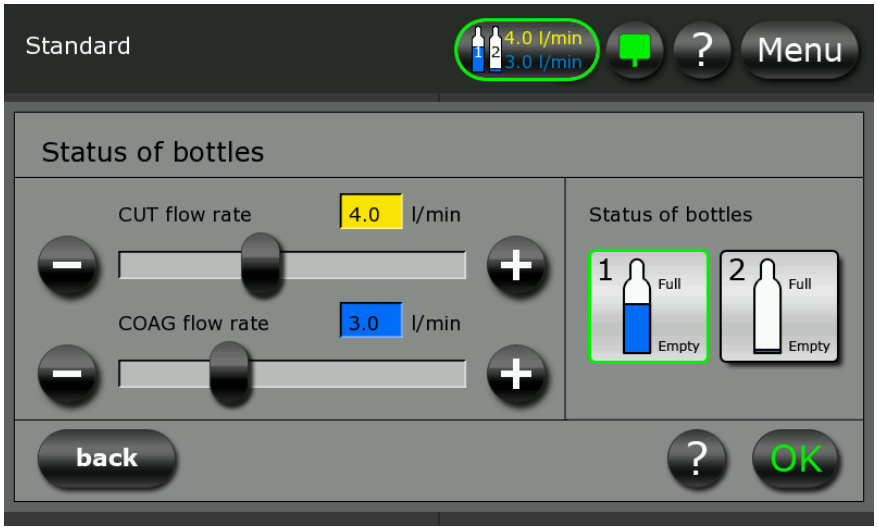


Figure 5-3: Fill level indicators on the ARC 400 display

When two gas bottles are connected with two pressure reducers, the gas bottle to be used can be selected in the Argon menu of the ARC 350 or ARC 400. In this case changeover to the spare bottle occurs automatically when the gas pressure in the bottle being used drops below a specific level. The user can recognise this from the indicator on the ARC generator display.

If a connected gas bottle is empty, a warning message is shown on the display of the ARC generator and an acoustic signal is emitted. The Purge button **3** on the ARC PLUS blinks red. In this way surgical staff are altered to the need for replacing the empty argon bottle with a full one.

Figure 5-4: No bottle connected or bottle pressure too low

5.5. Purge function

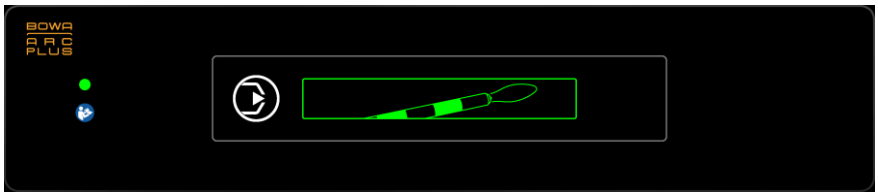


Figure 5-5: Purging active

When the Purge button **3** is pressed, the instrument is purged with argon for a few seconds. This process is required in particular for argon-assisted electrosurgery in the gastrointestinal tract. The flammable or explosive endogenous gases that must be assumed to be present there must always be purged with CO_2 or argon in the endangered intestinal section before activating the HF device and argon coagulation.

Pressing the Purge button **3** can also help to remove any tissue deposits in the lumen near the electrode tip. For this reason, purging should also be carried out if the plasma does not ignite.

The gas status indicator **4** lights up green during purging.

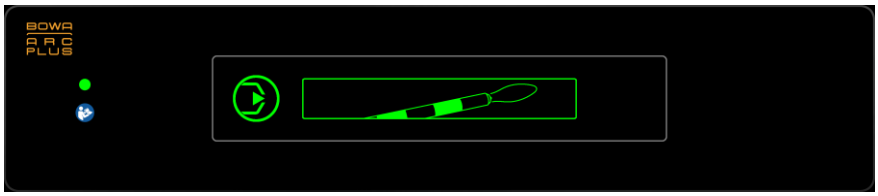


Figure 5-6: Purging active and Purge button actuated

5.6. Post-surgery instructions

The procedure described below is recommend after completion of surgery.

5.6.1. Shutting off the argon gas

Check the primary gas pressure on the pressure gauge of the pressure reducer. If it is less than 30 bar, exchange the gas bottle. Activation is not possible with a gas pressure below 2 bar. If there is still sufficient pressure in the gas bottle, close the bottle valve by hand to prevent potential gas loss.

5.6.2. Exchanging the gas bottle

Close the bottle valve by hand and disconnect the pressurised gas line from gas connector **12** or **14** on the rear panel of the ARC PLUS, and disconnect the electronic pressure sensor (if present) from connector **11** or **13**.

Then press the pressurised gas line connector onto bleed stub **9** on the rear panel to allow the residual pressurised argon to escape. After this the pressure reducer can be manually unscrewed from the gas bottle and a new bottle can be fitted. Observe the use instructions for the pressure reducer. Ensure that the gas bottle is securely attached to the equipment trolley. Switch off the HF device.

6. Detecting and Correcting Faults

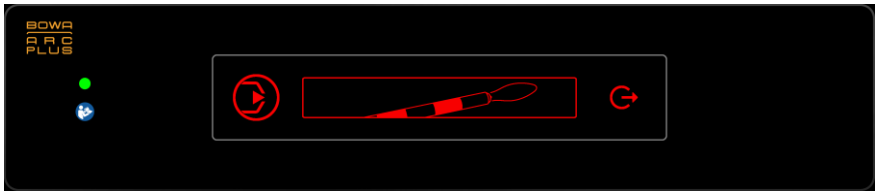


Figure 6-1: Internal fault

The ARC PLUS enables continuous monitoring of all relevant device functions. The fault indicator **5** lights up red when a serious fault condition is signalled.

6.1. Fault list

Visual and acoustic fault indications

Fault conditions are indicated by messages on the HF generator along with visual and acoustic signals. Furthermore, in the event of certain faults the generator cancels activation and the system is reset.

Visual and acoustic signals:

Signal	Designation
	“Output fault” indicator lights up red
	Acoustic warning signal sounds

The following fault messages are displayed by the ARC 400 in combination with the ARC PLUS:

Heading	Fault message
ARC PLUS Fault	Please check if the argon bottles are connected and open. Empty bottles should be replaced. Subsequently restart ARC PLUS by activating the flashing ""Purge"" button.
ARC PLUS Fault	The argon inlet pressure is too high. Max. inlet pressure: <4.5bar Close a source of argon gas in the appropriate pressure range. Subsequently restart ARC PLUS by activating the flashing "Purge" button.
ARC PLUS Fault	The argon inlet pressure has exceeded the permissible limits. Inlet pressure range: 2 - 4.5bar Close a source of argon gas in the appropriate pressure range. Subsequently restart ARC PLUS by activating the flashing "Purge" button.
ARC PLUS Warning	Please check if the argon bottles are connected and open. Empty bottles should be replaced. Subsequently restart ARC PLUS by activating the flashing "Purge" button.
ARC PLUS Warning	Mixed operation of argon bottles with and without an electric bottle pressure gauge is not recommended Connect two identical pressure reducers.

Heading	Fault message
ARC PLUS Warning	Please check if the instrument is free of adhesions, and purge it with argon. If repeated purging does not solve the problem, the instrument and cable must be replaced.
ARC PLUS Fault	Please check if the argon bottles are connected and open. Empty bottles should be replaced. You can connect two argon bottles. The unit shifts automatically to the second bottle
ARC PLUS Warning	The argon flow settings at ARC 400 are invalid
ARC PLUS Warning	The filling level of the argon bottle is low. Please make sure that a replacement is available. You can connect two argon bottles. The unit shifts automatically to the second bottle.
ARC PLUS Fault	The argon bottle is empty. Connect a replacement bottle to enable activation. You can connect two argon bottles. The unit shifts automatically to the second bottle
ARC PLUS Notice	The argon bottle is empty. The unit has shifted automatically to the replacement bottle. Please make sure that a replacement is available
ARC PLUS Fault	Please check if the argon bottles are connected and open. Empty bottles should be replaced. Subsequently restart ARC PLUS by activating the flashing "Purge" button
TSI ARC PLUS Warning	The annual Technical Safety Inspection (TSI) for ARC PLUS is due. Initiate this inspection as soon as possible. Any further use of the unit is at the user's risk.

▶ Contact the service centre (see Section “Repairs”. page 38) if you are unable to correct a fault by following the indicated instructions.

Unlisted faults

▶ Additional detailed information is available in the Service Manual.

▶ Contact the service centre (see Section “Repairs”. page 38) in case of any faults not shown in the fault list.

▶ If the expected change in the tissue does not occur and no fault message appears, check the parameter values and the accessory connections.

7. Cleaning

7.1. Cleaning of accessories

- Clean the accessories (e.g. surgical handpieces, instruments, active electrodes, neutral electrodes and cables) as described in the associated operating manuals.
- Check the accessories before and after use for damage and ensure that they are working properly.

7.2. Disinfection and cleaning

NOTE

Incorrect use of the HF device can cause damage to the unit

- Never sterilize the argon device. Instead, clean or disinfect it.

WARNING

Risk of electric shock and fire

- Unplug the power cable before cleaning the device.
- For cleaning surfaces, use the approved cleaning agents or disinfectants only as specified by the manufacturer.
- Follow the procedure specified in your hospital or use a proven infection control method.
- Ensure that no liquid penetrates the device.

1. Apply the cleaning and/or disinfection agent (with the device switched off and the power cord unplugged).
2. Wipe the agent off with a sponge or cloth moistened with clean water.
3. Dry the device using a clean, lint-free cloth.

Do not sterilise the pressure reducer or the gas hose. Use wiping disinfection to clean and disinfect the surfaces.

8. Maintenance and Repair

8.1. Maintenance

⚠ DANGER

Infection hazard

- To avoid spreading germs and infections, disinfect the device and pack it in the shipping packaging before it leaves the hospital or surgical practice.

- After each use, check the device, the device trolley and the accessories (e.g. foot switch and cable) for damage or defects. In particular, ensure that the insulation is intact on all cables.
- Do not use any damaged device, damaged device trolley or damaged accessories.
- Replace defective accessories immediately.
- Have the safety inspection for the device performed once a year. Consult the appropriate service manual for additional technical information.

8.1.1. Technical safety inspection (TSI)

Safety inspections must be performed once a year.

- The device and accessories may be inspected only by persons who have the required training, knowledge and experience and who can perform the inspection independently.
- With regard to the safety inspection, you must comply with the country-specific rules and regulations.

The inspector documents the inspection results and measured values according to the inspection record.

In the case of severe deviations from the values on the final acceptance report, or if the stated maximum values have been exceeded:

- Send the ARC PLUS to a service centre (see Section “Technical service“, page 39).

8.2. Repairs

NOTE

The ARC PLUS may be damaged if you attempt to do your own repairs or modifications.

- ▶ If a repair is necessary, always have it done by the service centre specified below.
- ▶ Never carry out any repairs yourself.

BOWA accepts liable for the safety, reliability and performance of the argon device only under the following conditions:

- Full compliance with all instructions regarding the installation and proper use for the intended purpose contained in this operating manual.
- Changes, repairs, new settings and the like are performed only by persons authorised by BOWA to do this work.
- The electrical distribution system in the relevant room complies with local regulations and statutory provisions.

Maintenance of the device is necessary whenever a fault indication and/or malfunction occurs. Before returning the device, contact a BOWA field service employee or an authorised dealer. The following information is required for returning the device:

Prompt and satisfactory repairs can only be performed when all required data has been supplied in full.

- Complete address
- Model number
- Serial number
- Software version

- ▶ Describe the problem, the application concerned and the accessories used.

or

- ▶ Describe the repairs to be made.

On a case by case basis, it must be agreed whether remote diagnosis is possible or returning the device, possibly with temporary replacement by a loaner device, is necessary.

8.3. Technical service

Contact the following service centre for maintenance and repairs:

BOWA-electronic GmbH & Co. KG

Heinrich-Hertz-Straße 4–10

72810 Gomaringen, Germany

Phone +49 (0) 7072-6002-0

Fax +49 (0) 7072-6002-33

or visit our website:

www.bowa-medical.com

9. Storage

- ▶ If the HF device is stored longer than one year, observe in particular the functional test indications described in Section “Functional test”, page 29.
- ▶ Clean the HF device thoroughly before putting it into storage.
- ▶ Store the HF device in a clean, dry place in accordance with the specified storage conditions.

Storage and transport conditions

- Temperature: -20 °C to +50 °C
- Relative humidity: 0 to 75%, non-condensing
- Atmospheric pressure: 500 to 1600 hPa

10. Technical Specifications

10.1. ARC PLUS technical data

Compatibility	
BOWA HF generators	ARC 400 (item no. 900-400), V1.0.0.4.16.8 or later, ARC 350 (item no. 900-351)
BOWA pressure reducers	Item no. 900-901, 900-902, 900-903, 900-904, 900-906, 900-907, 900-908, 900-909

Insulation type / Classification	
EMC	IEC 60601-1-2:2007 + Cor. (2010)
Enclosure protection rating	IP22
Protection class according to EN 60601-1	I
Compliance with standards	IEC 60601-1:2005 + Cor. 1 (2006) + Cor. 2 (2007) IEC 60601-1-2: IEC 2007:2007 & Cor. (2010) IEC 60601-2-2: 2009; IEC 62366: 2007 ISO 14971: 2007 ISO 13485:2003 + Cor. 1 (2009)
Classification according to EC Directive 93/42/EEC	IIa

Power connection	
Power consumption in Sleep mode	1 W / 20 VA
Power consumption in Standby mode	5 W / 25 VA
Max. power consumption	32 W / 65 VA
Max. current consumption	0.6 A
Input voltage range	100 – 240 V ±10%
Mains frequency	50/60 Hz
Mains fuses	2x 1 A slow-blow
Equipotential bonding terminal	√

Argon functions	
Argon plasma coagulation	√
Argon-assisted cutting	√
Gas flow regulation	√
Flow setting	√ (by BOWA HF generator)
Flow indication	√ (by BOWA HF generator)
Max. flow rate	10.0 l/min
Min. flow rate	0.1 l/min
Manual purging	√

Gas supply	
Gas type	Argon, minimum purity 4.8 (99.998%)
Gas port (inlet)	2x
Inlet pressure with gas bottle operation	Max. 4.5 bar
Inlet pressure with central gas supply	Max. 6.0 bar (optional)
Bottle fill level measurement (electronic)	√ (with 4–20 mA current interface) only in combination with pressure reducer 900-906, 900-907, 900-908, or 900-909
Gas outlet pressure	Max. 2 bar
Gas bottle changeover automatic/manual	√ / √ (manual using BOWA HF generator)
Gas bottle fill level indication	√ (by BOWA HF generator)
Advance visual/acoustic warning of gas shortage	√ / √

Dimensions and weight	
External dimensions: width x height x depth (mm)	433 x 97 x 489
Weight	approx. 7.7 kg

Controls and indicators	
One capacitive button (backlight)	Manual purging
Status LED	√
Activation indication visual/acoustic	√ / √ (by BOWA HF generator)
Fault indication visual/acoustic	√ / √

Safety features	
ISSys: Integrated Safety System	√
Continuous flow monitoring	√
Continuous self-test	√
Continuous status indication	√
Hose blockage detection	√
Acoustic warning	√
Fault indication on ARC PLUS and detailed fault description on BOWA HF generator	√

Documentation	
Data acquisition and storage in the device	√ (system data with time stamp)
Fault states	√
Operating errors	√
Data display on BOWA HF generator	√ (messages with additional information)

Communication	
External interface for communication with BOWA HF generators (fibre optic cable)	√
Serial interface to external PC using BOWA software	√

Service support	
Service support serial interface using BOWA software	√

Cooling	
Convection	√
Temperature-controlled fan	—

Duty factor	
Duty factor	Continuous operation

11. Accessories and Spare Parts

Original BOWA accessories are suitable for use with devices in the ARC and ARC PLUS families. When using accessories made by other manufacturers, the user must ensure that they are designed for and compatible with the maximum HF peak voltage of the HF device.

For the use and proper cleaning and disinfection of autoclavable devices, observe the instructions for use accompanying these devices.

Detailed information on accessories and replacement parts is available in the current accessories catalogue.

NOTE

Only instruments and accessories designed for use with argon may be used. In particular, the use of infusion accessories is not allowed.

12. EMC

12.1. Guidelines and manufacturer's declaration in accordance with IEC 60601-1-2, Section 6.8.3.201

Electromagnetic interference (IEC 60601-1-2, Table 201)		
The ARC PLUS is intended for operation in an electromagnetic environment as described below. The customer or user of the ARC PLUS should ensure that it is operated in such an environment.		
Interference measurements	**Conformity**	**Electromagnetic environment guideline**
HF emissions as specified in CISPR 11	Group 2	The ARC PLUS must emit electromagnetic energy in order to perform its intended functions. Nearby electronic devices may be affected.
HF emissions as specified in CISPR 11	Class B	The ARC PLUS is suitable for use in facilities other than those in the residential environment and those connected directly to a public power supply network that also supplies power to buildings used for residential purposes.
Emission of harmonics as specified in IEC 61000-3-2	Class A	
Emission of voltage fluctuations or flicker as specified in IEC 61000-3-3	Conforms	

Electromagnetic immunity (IEC 60601-1-2, Table 202)			
The ARC PLUS is intended for operation in the electromagnetic environment described below. The customer or user of the ARC PLUS should ensure that it is operated in such an environment.			
Immunity test	**IEC 60601 test level**	**Conformity level**	**Electromagnetic environment guidelines**
Electrostatic discharge (ESD) according to IEC 61000-4-2	±6 kV contact discharge	±6 kV contact discharge	Floors should be made of wood or cement or covered with ceramic tiles. If the floor is covered with synthetic material, the relative humidity must be at least 30%.
	±8 kV air discharge	±8 kV air discharge	
Fast transient electrical interference or bursts as specified in IEC 61000-4-4	±2 kV on power supply lines	±2 kV on power supply lines	The quality of the mains power should correspond to that of a typical business or hospital environment.
	±1 kV on input and output lines	±1 kV on input and output lines	
Surges as specified in IEC 61000-4-5	±1 kV between external lines	±1 kV between external lines	The quality of the mains power should correspond to that of a typical business or hospital environment.
	±2 kV external line to ground	±2 kV external line to ground	

Electromagnetic immunity (IEC 60601-1-2, Table 202)			
Voltage dropouts, brief interruptions and fluctuations in the supply voltage as specified in IEC 61000-4-11	< 5% U_T for ½ period (> 95% dropout) 40% U_T for 5 periods (60% dropout) 70% U_T for 25 periods (30% dropout) < 5% U_T for 5 s (> 95% dropout)	< 5% U_T for ½ period (> 95% dropout) 40% U_T for 5 periods (60% dropout) 70% U_T for 25 periods (30% dropout) < 5% U_T for 5 s (> 95% dropout)	The quality of the mains power should correspond to that of a typical business or hospital environment. If the user of the ARC PLUS requires it to continue operating even in the presence of power interruptions, it is recommended to operate the ARC PLUS from an uninterruptible power supply or a battery.
Note: U_T is the AC supply voltage prior to the application of the test level.			

Electromagnetic immunity (IEC 60601-1-2, Table 204)			
The ARC PLUS is intended for operation in the electromagnetic environment described below. The customer or user of the ARC PLUS should ensure that it is operated in such an environment.			
Immunity test	**IEC 60601 test level**	**Conformity level**	**Electromagnetic environment guidelines**
Conducted HF interference as specified in IEC 61000-4-6	3 V rms 150 kHz to 80 MHz	10 V	Portable and mobile wireless devices should not be used within the recommended protective distance from the ARC PLUS and its cables, which is calculated using the formula appropriate to the relevant transmission frequency. **Recommended protective distance:** $d = 0.35 \times \sqrt{P}$ $d = 0.35 \times \sqrt{P}$ for 80 MHz to 800 GHz $d = 0.35 \times \sqrt{P}$ for 800 MHz to 2.5 GHz where P is the nominal transmitter output in watts (W) specified by the transmitter manufacturer and d is the recommended protective distance in metres (m). The field strength of stationary transmitters as determined by on-site measurements[a] should be lower than the compliance level[b] at all frequencies. Interference is possible in the vicinity of devices bearing the following symbol:
Radiated HF interference as specified in IEC 61000-4-3	3 V/m 80 MHz to 2.5 GHz	3 V/m	
Note 1	The higher frequency range applies in case of 80 MHz and 800 MHz.		
Note 2	These guidelines may not be usable in all cases. The propagation of electromagnetic waves is influenced by absorption and reflection by buildings, objects and people.		
a	It is not possible to accurately predict the field strength of stationary transmitters such as base stations for mobile telephones and land mobile radios, amateur radio transmitters, AM and FM radio broadcast transmitters and TV broadcast transmitters. An EMC site survey with regard to stationary transmitters should be considered in order to determine the effect of their electromagnetic transmissions. If the measured field strength at the location where the ARC PLUS is used exceeds the aforementioned compliance level, the ARC PLUS should be monitored to verify proper operation. If unusual behaviour is observed, additional measures may be necessary, such as changing the orientation or location of the ARC PLUS.		
b	The field strength should be less than 3 V/m over the frequency range of 150 kHz to 80 MHz.		

Recommended protective distance between portable and mobile HF telecommunication devices and the ARC PLUS (IEC 60601-1-2, Table 206)			
The ARC PLUS is designed for operation in an electromagnetic environment with controlled HF interference. The customer or user of the ARC PLUS can help to prevent electromagnetic interference by complying with the minimum distance between portable and mobile HF telecommunication devices (transmitters) and the ARC PLUS. These distances depend on the output power of the communication device as listed below.			
Nominal transmitter output (W)	**Protective distance (m) depending on transmission frequency**		
	150 kHz to 80 MHz d = 0,35 × √P	80 MHz to 800 GHz d = 1.17 × √P	800 MHz to 2,5 GHz d = 2.33 × √P
0.01	0.035	0.12	0.233
0.1	0.11	0.37	0.737
1	0.35	1.17	2.33
10	1.1	3.70	7.37
100	3.5	11.70	23.30
For transmitters whose maximum nominal output power is not listed in the table above, the recommended protective distance d in metres (m) can be determined using the formulas in the relevant column, where P is the maximum nominal output power of the transmitter in watts (W) as specified by the transmitter manufacturer.			
Note 1	The higher frequency range applies in case of 80 MHz and 800 MHz.		
Note 2	These guidelines may not be usable in all cases. The propagation of electromagnetic waves is influenced by absorption and reflection by buildings, objects and people.		

13. Disposal

You must comply with the national regulations of the relevant country when disposing of or recycling the device or its components.

Symbol	Designation
	A device marked with this symbol must be put into a separate waste container for electrical and electronic devices. Disposal is carried out free of charge by the manufacturer within the European Union.

▶ If you have any questions regarding product disposal, contact the service centre (see Section “Technical service“, page 39).

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